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OGC® KML Standard Development Best Practices

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i. Background

In early 2007, Google proposed to the OGC that KML be submitted to the OGC to become an OGC standard. In June 2007, KML 2.1 was approved as an OGC best practice. The preamble to the document stated the reasons for KML becoming an OGC standard :

1. That there be one international standard language for expressing geographic annotation and visualization on existing or future web-based online maps (2d) and earth browsers (3d).

2. That KML be aligned with international best practices and standards, thereby enabling greater uptake and interoperability of earth browser implementations.

3. That the OGC and Google will work collaboratively to insure that the KML implementer community is properly engaged in the process and that the KML community is kept informed of progress and issues.

4. That the OGC process will be used to insure proper life-cycle management of the KML candidate specification, including such issues as backwards compatibility.

In April 2008, KML 2.2 became an official OGC standard. In order to meet objective 4, the OGC and the Google KML community needed to define a procedure for life cycle management of the OGC KML standard.

ii. Preface

This Best Practices Document provides guidance on the revision process for OGC KML. The intended audience is the OGC Mass Market Working Group (MMWG), current or future KML Standard Working Groups (SWG), and Technical Committee (TC) members as well as KML application developers and users with regards to progressing the OGC KML standard such that KML:

- Remains true to its purpose: encoding the visualization and navigation of information within a geographic context for earth browser systems;
- Is enhanced on the basis of proven extensions requested by the mass market;
- Provides general solutions that meet end user performance expectations within current software and hardware limitations, with due consideration for legacy software/hardware;
- Progresses on a regular and consistent revision cycle that assures the timely development of new applications required by the rapidly growing and changing mass market environment.

The guidance is based on a well-received presentation given by OGC Member Google to the MMWG on past KML and earth browser development practices which proved successful to the growth and adoption of KML within the mass market community. Agreeing with the general process and principles described therein, the MMWG elected to summarize recommendations for continuing the successful evolution of the KML standard within a combined mass market and OGC framework. The policies and procedures documented herein are the result of those discussions.

iii. Submitting organizations

The following organizations as members of the OGC Mass Market Working Group have submitted this Best Practices Paper to the Open Geospatial Consortium Inc.:

a) Google, Inc.

b) Galdos Systems Inc.

c) European Union Satellite Centre (EUSC)

iv. Submission contact points

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v. Revision history

Date	Release	Author	Paragraph modified	Description
24-06-08	0.1	Tim Wilson, Bent Hagemark	All	Initial version.
26-06-08	0.2	Michael Ashbridge	5.2; 6.1; 6.2	Terminology edits.
30-06-08	0.3	Tim Wilson	All	Revision and completion of first draft.
02-07-08	0.4	Tim Wilson, Bent Hagemark, Michael Ashbridge	Preamble; Introduction	Reference to MMWG presentation; list of KML clients referenced.
7/7/08	0.5	Carl Reed	Various	Prepare for posting to Pending for member review.
20-08-2008	0.6	David Burggraf	i-v, Intro, 4, 5, 6, 7	Further edits in preparation for posting to Pending on the OGC Portal

vi. Changes to the OGC® Abstract Specification

The OGC® Abstract Specification does not require changes to accommodate this OGC® Best Practices Document.

Foreword

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. The Open Geospatial Consortium Inc. shall not be held responsible for identifying any or all such patent rights.

Recipients of this document are requested to submit, with their comments, notification of any relevant patent claims or other intellectual property rights of which they may be aware that might be infringed by any implementation of the standard set forth in this document, and to provide supporting documentation.

Introduction

The Free Dictionary defines mass market as, "*of, relating to, or produced for consumption in large numbers …*". In this regard, KML is a mass market standard that facilitates the visualization and navigation of information within a geographic context.

The current geo-mass market operating environment has the following characteristics:

- Consists of millions of users, most of whom are non-experts with respect to the geospatial domain;
- Using tens of millions of existing and indexed KML files and resources;
- Within a large and growing list of earth browser applications;
- On fairly average and diverse equipment, including the expanding use of mobile devices;
- All of which is growing rapidly.

To support this environment, KML has been developed to date according to a process and principles whereby the language:

- Allows for unexpected and unintended uses;
- Supports multi-purpose constructs and mechanisms;
- Provides a core API that can be extended according to a well-defined model;
- Is extended incrementally to support new mass market applications;
- Changes formally only for those extensions that are proven through mass market adoption.

The rapid and widespread uptake of KML by the mass market attests to the benefits of this approach and advocates for its continuation within OGC KML standardization processes. As such, this document provides guidance on assuring similar success in the progression of the OGC KML standard.

OGC® KML Standard Development Best Practices

1 Scope

This OGC® Best Practices Document provides guidelines for developing the OGC KML standard in a manner that best serves and supports the KML application developer and user communities. It applies to the extension of KML by application developers and the subsequent enhancement of the KML standard by the OGC.

2 Conformance

There are no conformance clauses for this Best Practices Document.

3 Normative references

The following normative documents contain provisions that, through reference in this text, constitute provisions of this part of OGC® 08-125r1. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply; however, parties to agreements based on this part of OGC® 08-125r1 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

OGC 07-147r2, OGC KML

OGC 07-134r2, OGC KML 2.2 - Abstract Test Suite

4 Terms and symbols

4.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

4.1.1

KML extension

An extension of the core KML language, using the normative KML extension model and policies, to support new mass market applications.

4.1.2

KML enhancement

A standardized KML extension integrated into the core KML language.

4.2 Acronyms (and abbreviated terms)

Some frequently used abbreviated terms:

ATS	Abstract Test Suite
DWG	Domain Working Group
GIS	Geographic Information System
HTTP	Hyper Text Transfer Protocol
IETF	Internet Engineering Task Force
KML	Keyhole Markup Language
MMWG	Mass Market Working Group
OGC	Open Geospatial Consortium
RFC	Request for Comments
SWG	Standards Working Group
UML	Unified Modeling Language
XML	Extensible Markup Language
XSD	XML Schema Definition

5 Conventions

5.1 UML Notation

There is no UML associated with this Best Practices Document.

5.2 XML Namespaces

All components of the KML schema are defined in the namespace with the identifier "`http://www.opengis.net/kml/2.2`", for which the prefix kml or the default (no prefix) namespace is used within this Best Practice Document.

6 KML development process

6.1 overview

KML was historically developed by cycling through the following development phases:

- **respond** to the wisdom of the masses as to what new functionality KML should support;
- **build** the new functionality as running code;
- **assure** its compatibility and performance;
- **specify** the KML language extension to support it;
- **release** the KML extension API and application(s) built upon it;
- **measure** its utility via usage statistics, performance metrics, and user feedback;
- **formalize** it within the core language only if proven to be of general, popular, and effective use.

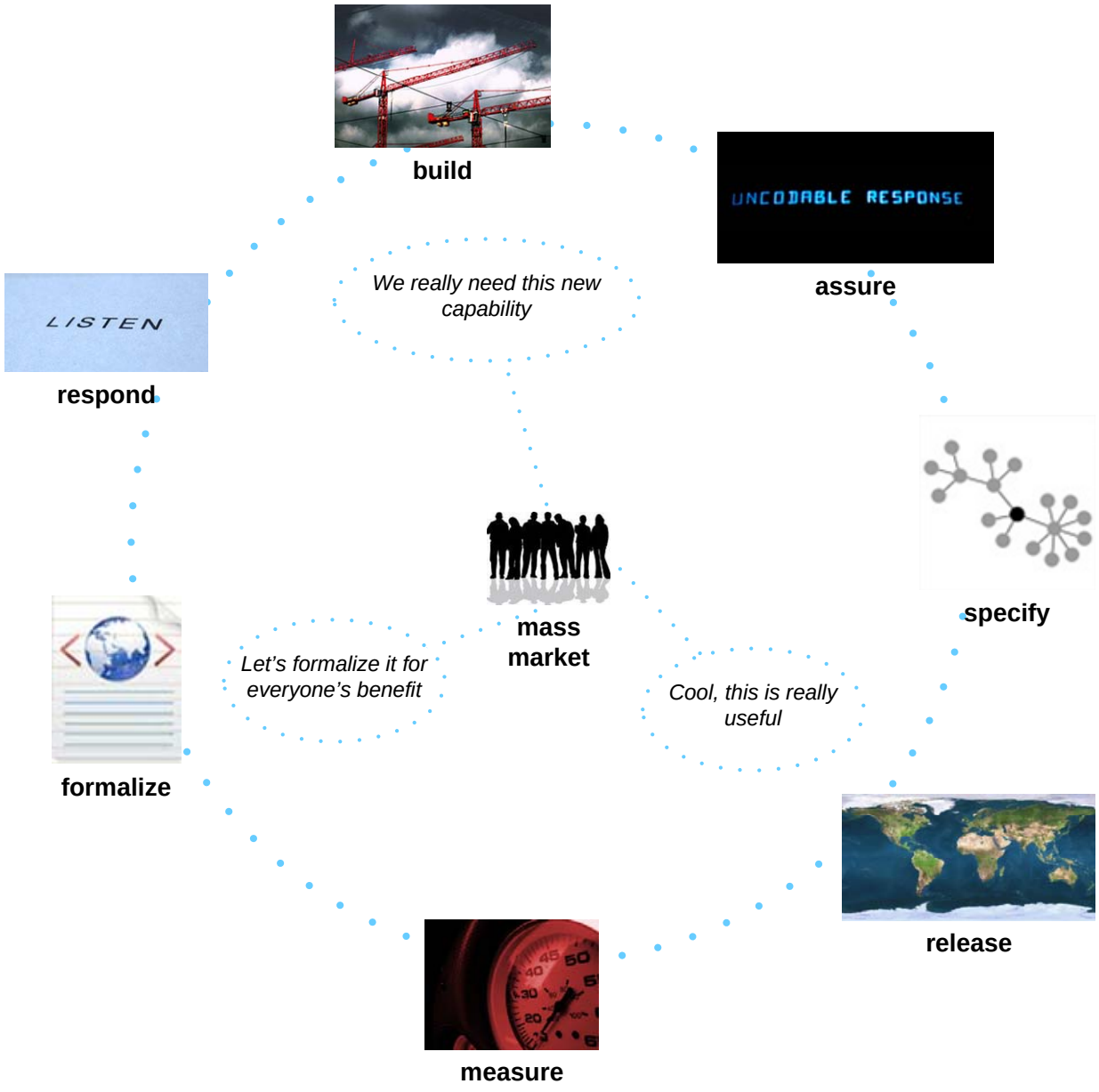

Figure 1 ·· KML development phases

6.2 development phases

6.2.1 respond

As with any successful social or commercial enterprise, KML has evolved according to the needs of its user base. The mass market geo community continues to express its wants and needs via bulletin boards, blogs, forums, community projects, and the OGC Mass Market Working Group, amongst other feedback mechanisms. Developing KML in response to current and predominant mass market application requirements will continue to assure its value and relevancy.

6.2.2 build

An overriding principle for any KML development is that the *proof is in its application*. Coding ideas early in the revision process helps to determine whether new concepts and extensions can be effectively built and integrated into existing applications while still meeting new requirements.

6.2.3 assure

The following questions should be addressed when designing and implementing any KML extension:

- Are old implementations well behaved (e.g. stable) when faced with new KML extension data? There is an assumption that a significant percentage of existing KML implementations may never be upgraded.
- Are new implementations friendly to existing data? Assume old data exists forever and can never be changed.

In this regard, backward compatibility of any new KML data with respect to existing and limited clients is a paramount goal. In practice this means KML development should focus on incremental enhancements, rather than refactoring or redesign.

KML enhancements should also consider forward compatibility in their design by facilitating the graceful handling of new components by old clients.

6.2.4 specify

To support adoption and 3rd party usage, a KML extension should be well defined within an API specification document, and include sample files that demonstrate:

- normal or intended uses;
- any known edge cases and their recommended handling;
- integration with existing core KML;

- integration with the KML update mechanism (see kml:Update in OGC KML Standard).

Such documentation should be understandable to the average, non-expert user.

6.2.5 release

Release the KML extension API, samples, and application(s) built upon it. Promote experimentation and seek feedback.

6.2.6 measure

Record user feedback and usage statistics to help determine adoption rate and performance results. Pay attention to the handling of 'edge cases' i.e. combinations of extreme or omitted element values (e.g. geometry near poles or antemeridian) and revisit design, if necessary, to mitigate any unforeseen negative results.

6.2.6.1 adoption

As mass market usage is an overriding indicator of the significance and utility of a KML extension, adoption rates should be measured and made accessible for verification.

6.2.6.2 performance

Application performance is a predominant goal. In practice, this means KML evolution should focus on solutions that meet end user performance expectations within current software and hardware limitations.

Performance requirements should not exceed common hardware devices of non-expert users. Such devices increasingly include mobile clients.

Important considerations affecting the design, implementation, and/or standardization of any KML enhancement include:

- How does the enhancement behave on weak, limited, and/or mobile devices?
- How much texture memory does the enhancement require? How many clients right now have this much? What happens to those that still have old gear?

Performance statistics should be accessible for those exemplar applications using the new KML extension.

6.2.6.3 edge cases

KML enhancements should minimize the possibility of encoding any ambiguous, extreme, or meaningless values. Where this is not possible, facilitating graceful degradation within encodings and clients is encouraged.

Exemplar applications using the KML extension should test any and all known edge cases using representative sample files.

6.2.7 formalize

Formalization of a new KML extension can occur as a last step when and where it:

- adheres to the requirements of the existing OGC KML standard;
- adheres to the best practices outlined in this document as much as possible;
- provides a satisfactory and general solution for the new functionality it provides;
- has proven itself useful through adoption within the mass market;
- would enhance the core KML language;
- is formally offered to the OGC for standardization by the owning party or parties. This includes a commitment to assign any existing intellectual property associated with the extension to the OGC.

The OGC KML standard follows a certain architecture that should persist within KML extensions and enhancements in order to maintain stable application development, facilitate the reuse of existing client code, and ease the understanding of new components.

7 OGC KML standardization

7.1 overview

While the OGC is now the owner and forum for enhancing the KML standard, the mass market itself remains the de facto place for KML application development and therefore those KML extensions that support them.

Natural stages and roles exist within the overall progression of KML, as shown in the following diagram.

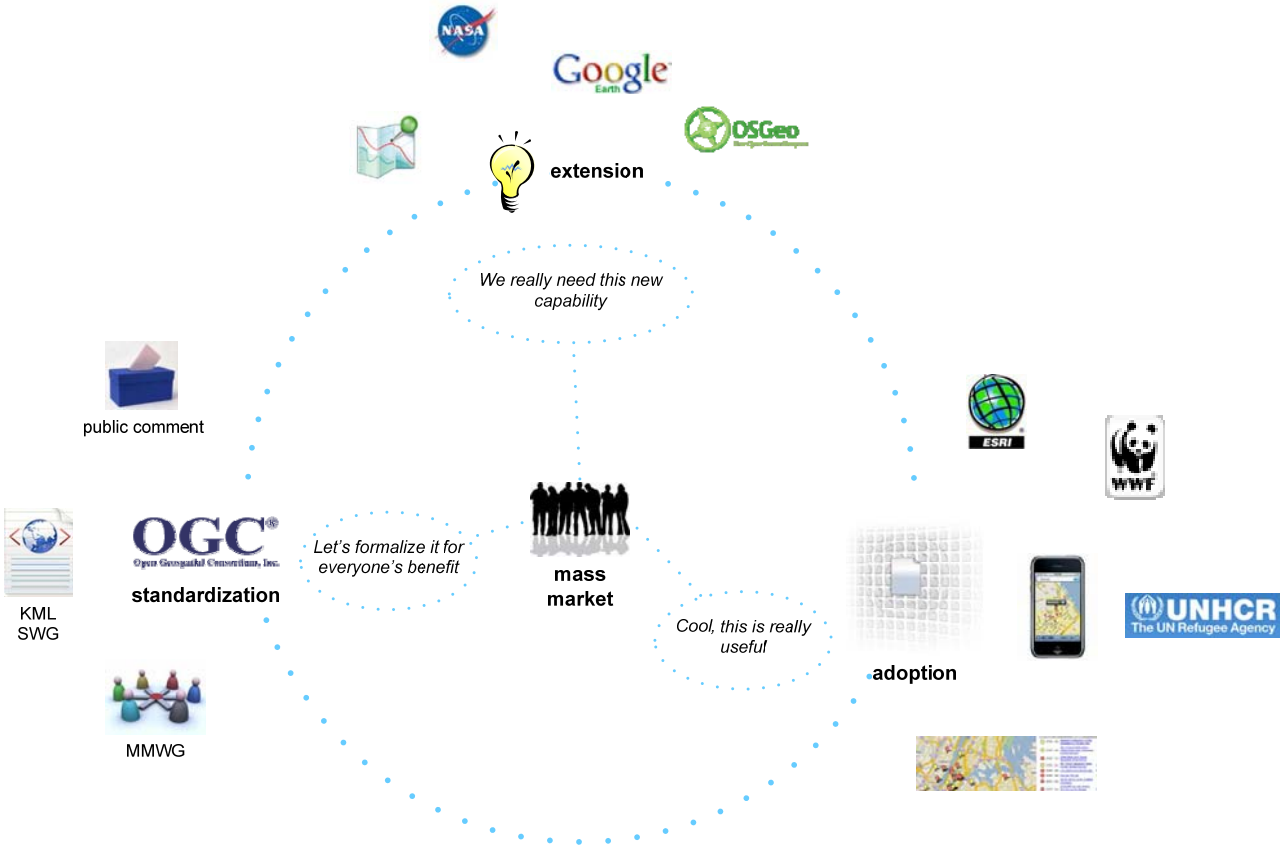

Figure 2 ·· KML evolution

7.2 KML progression

For simplicity of discussion, the KML development phases are summarized into three general progression stages as follows:

- **extension** ·· This includes the **respond**, **build**, **assure**, **specify**, and **release** activities. The outcome is a KML extension API and application(s) built upon it. Such development is expected to be performed by individual vendors or organizations, although discussion amongst groups during such development is encouraged.
- **adoption** ·· Uptake within and by the mass market of a KML extension API and originating and 3rd party applications built upon it. Performance and most critically adoption rates should be **measured** to support assessment of the extension within the standardization process.
- **standardization** ·· **Formalize** proven KML extensions as enhancements to the core KML language. The OGC MMWG should provide guidance on priority enhancements, while the KML SWG conducts the technical evaluation and integration of such enhancements into the KML standard, ATS, and schema.
- A key requirement of the standardization process is that the developers of the enhancement and/or extension submit an official OGC Change request into the OGC process. These change requests are public and may be submitted into the OGC process using the public CR submission form at <new url>. The developer may also submit a Change Request via the work done in the MMWG. However, CR submitted as part of normal OGC activities will also be publicly available.
- PLEASE NOTE: No new extension or enhancement to KML will be considered for a revision to the OGC KML standard unless a CR is submitted!

7.3 roles

7.3.1 KML users

The KML user community serves as the hub of mass market geo ideation, experimentation, and adoption. It includes your average Geo, not your average Geo, non-profits, academic institutions, corporations, and public agencies who are creating and/or using KML. In short, almost anyone anywhere involved with the visualization of information within a geographic context.

7.3.2 KML application providers

KML application providers include the larger earth browser providers, 3rd party application developers, GIS software vendors, mobile providers, and others. As they develop and provide earth browser functionality to KML users they are best able to extend KML to meet new user requirements for earth browser technologies.

7.3.3 OGC MMWG

The MMWG, as a representative body for the mass market community, is best able to oversee the long-term development of the OGC KML standard. It represents a valuable forum for discussing feature requests and KML extensions that could satisfy them. There is likely also a role for the MMWG to advise on the prioritization of KML enhancements for standardization, and to arbitrate between any similar proposed enhancements.

7.3.4 OGC KML SWG

An OGC KML SWG best able to:

- establish a discrete charter with specific standardization objectives;
- assure a regular, timely and responsive KML development schedule;
- evaluate official OGC change requests and integrate proven KML extensions according to established standardization criteria;
- document any and all changes within a new KML standard revision (Revision notes).

To better perform these tasks, KML SWG members should preferably have mass market geo presence; participate actively in the MMWG; have technical expertise in KML applications and extensions; and remain actively involved in the KML SWG process.

7.4 KML SWG process guidelines

All revisions to the OGC KML standard shall use the same revision policies and procedures as detailed in the OGC Technical Committee Policies and Procedures. The following is a synopsis of additional guidance for the processing of the OGC KML standard for formal approval as an official OGC revision.

7.4.1 charter

A KML SWG should assure that KML remains true to its purpose: encoding the presentation and navigation of information within a geographic context.

The charter for KML SWGs should respect the KML development best practices outlined in this document.

A KML SWG should focus on incrementally enhancing the KML standard by evaluating and integrating KML extensions that have already been proven in the mass marketplace.

Only if there is sufficiently valuable and well-defined mass market needs for an application that *cannot* be accommodated by the current language primitives, shall a backwards-*in*compatible revision be contemplated. It is expected that the MMWG will advise on both the need and timing for any such major revision.

7.4.2 timeline

KML should evolve in a manner that satisfies the mass market need for regular and incremental enhancements of functionality. In practice this means a KML SWG should limit its scope of work to that which can be achieved within at most an annual release cycle.

A regular and consistent KML revision cycle will help to assure commercial development of earth browser technologies and applications within the rapidly changing mass market geo environment.

7.4.3 standardization criteria

A KML extension should be evaluated on the basis of how well it:

- is consistent with the purpose, architecture, and requirements of KML;
- is consistent with the KML standard development best practices;
- enables new mass market application(s) that are otherwise not supported by the existing KML core primitives;
- is proven through significant and verifiable adoption within the mass market;
- provides a general solution that meets end user performance expectations within current software and hardware limitations;

- is backwards compatible with previous minor KML revisions;
- includes a change request document meeting OGC requirements, as well as a set of test files for normal, edge, and update cases.

A KML SWG should assure backwards compatibility by testing against a normative set of KML test files. The normative set should include instances for all previous KML versions, starting with KML 2.1. The test coverage will naturally expand over time as a result of ongoing KML revisions. The KML SWG may additionally elect to test the compatibility using a reference KML parser such as the open-source libkml library.

7.4.4 KML enhancement

When enhancing the core KML language, a KML SWG should integrate an acceptable KML extension with as little disruption as possible to existing users and applications of KML as well as the extension itself. In practice this means using the same KML extension element and attribute names and structures as much as possible.

A new KML standard revision should address necessary changes to the KML standard, abstract test suite, and XML schema to incorporate the enhancement.

7.4.4.1 versioning

An incremental enhancement shall result in a minor revision of the KML Standard, i.e. `X.Y+1`; everything that validates against `x.y` shall validate against `X.Y+n`

A small, immediate and necessary fix to the KML Standard or XML schema shall result in a bug fix revision of the Standard, i.e. `X.Y.Z+1`; everything that validates against `X.Y.Z` shall validate against `X.Y.Z+n`, excepting those instances that are invalid with respect to the fixes themselves. `X.Y.Z+n` shall *not* introduce any new functionality from `X.Y.Z`

A backwards-*in*compatible revision shall result in a major revision of the KML Standard, i.e. `X+1.0.0` Major revisions are expected to rarely occur.

7.4.5 public comment

Draft KML enhancements must be posted for a 30 day public comment as per OGC SWG requirements. Feedback should be evaluated within the context of the standardization criteria.

7.4.6 KML revision

A KML revision, encompassing a new KML standard document, abstract test suite, and XML schema, must receive approval by the OGC Technical Committee (TC) before it is released as the next KML standard.

